1.0 PURPOSE OF AND NEED FOR ACTION

The following sections demonstrate the purpose and need for the project.

1.1 ADDRESS ROADWAY DEFICIENCIES

Route 460 has roadway design deficiencies that result in numerous problems related to safety, accommodation of truck traffic, hurricane evacuation and military preparedness. Route 460 does not comply with current VDOT design standards for roads of similar purpose and functional class. Route 460 is classified a rural principal arterial according to guidelines published by the American Association of State Highway and Transportation Officials (AASHTO). Using this classification, it does not meet VDOT's rural arterial design standards for lane width, median width, left turn lane protection, shoulder width, clear zone protection and access control. Details on these deficiencies are in the *Route 460 Location Study Purpose and Need Technical Report.*

1.2 IMPROVE SAFETY

Route 460 in the study area has higher accident, injury, and fatality rates than similar facilities statewide. Four-lane undivided roadways usually have higher than average crash rates due to the lack of median and access control and the impact that turning vehicles have on slowing traffic flows and increasing crash potential. Also, a high percentage of vehicles traveling on Route 460 are trucks. Larger vehicles operate less efficiently than standard passenger vehicles, increase roadway congestion, and increase accident severity. Of the 555 crashes documented by VDOT along the corridor from 1999 to 2001, 76 crashes involved tractor-trailers (14 percent). Approximately half of the fatal crashes in the Route 460 corridor involved tractor-trailers. Crashes involving tractor-trailers constituted approximately 28 percent of all property damage related to crashes.

A comparison between Route 460 and the average of four-lane roadways in Virginia confirmed Route 460's higher-than-average crash rates (see Table 1.2-1). The crash fatality rate for Route 460 in the study area is 220 percent greater than non-Interstate four lane freeways, with the injury crash rate 164 percent greater. Compared with divided roadways with no access control, the crash fatality rate in the Route 460 corridor is 137 percent greater; and the injury crash rate is 107 percent greater. The need to improve safety on Route 460 has been cited by the public via comments submitted to VDOT, and also by transportation managers of distribution centers located within the study area.

Table 1.2-1
CRASH RATES COMPARISONS – STUDY AREA TO OTHER FACILITY TYPES

Crash Rates by Facility Type	Route 460 Study Corridor	Rural Principal Arterials – Virginia Averages (2001)		
		4-Lane Divided No Access Control	4-Lane Divided; Partial Access Control	4-Lane Divided Full Access Control
# miles of Facility Type in VA	52	1,023	77	169
# Persons Killed (per 100 MVMT)	2.2	1.6	1.4	1.0
# Persons Injured (per 100 MVMT)	62.3	58.2	41.7	37.9
Total Crash Rate (per 100 MVMT)	77.7	83.1	64.2	54.1

1.3 ACCOMMODATE INCREASING FREIGHT TRAFFIC

Route 460 provides a link for seaport cargo and airfreight delivery between the ports and airports in both Hampton Roads and the Richmond - Petersburg Metropolitan Area. Therefore, it serves as an important shipping route and carries a large amount of truck traffic (see Table 1.3-1). Route 460 truck volumes within the study area currently range from approximately 2,600 to near 4,100 trucks per day, with through truck volumes near 3,700. This represents between six percent and 34 percent of all vehicles on Route 460. The percentage of through truck traffic along Route 460 is higher than and growing faster than on alternate routes such as Route 58 and Interstate 64. Along Route 460, the percentage of through trucks has increased by 13 percent since 1990. On Route 58 and Interstate 64, the percentage of through trucks has declined by 8 percent and 6 percent respectively.

Waterborne freight shipments to, from, and within Virginia are projected to increase from 24 million tons in 1998 to 40 million tons by 2020, an increase of 67 percent. The majority of this freight (59 percent) will be arriving and departing from the ports of Hampton Roads. To accommodate this increasing demand, two new port facilities will open in the future, increasing freight shipments from the ports. The increasing truck traffic on Route 460 combined with the geometric deficiencies of the existing roadway has led to operational problems.

Table 1.3-1
CHANGE IN ANNUAL AVERAGE DAILY TRAFFIC (AADT) AND TRUCK TRAFFIC ON MAJOR ROUTES

Major Freight Routes	1990 Data			2002 / 2003 Data		
	Total AADT	Truck AADT	Percent Trucks	Total AADT	Truck AADT	Percent Trucks
I-64 (at New Kent County / James City County Line)	27,130	3,230	12	42,000	2,520	6
US 460 (at Rt 616 in Ivor)	9,700	2,037	21	11,100 *	3,770 *	34 *
US 58 (at Rt 653 in Capron)	7,355	1,755	24	13,000	2,080	16

Source: VDOT, Average Daily Traffic Volumes with Vehicle Classification Data on Interstate, Arterial and Primary Routes, 1990 and 2002

* Route 460 traffic counts conducted summer 2003

1.4 REDUCE TRAVEL DELAYS

Future traffic volumes will result in increased travel delays on Route 460 due to capacity limitations at traffic signals and the lack of access control. Traffic forecasts for 2026 were based upon traffic growth and diversion of traffic from other facilities. The super-regional travel demand model (a combination of the Hampton Roads and Richmond regions' travel demand models) indicates annual traffic growth rates on Route 460 ranging from 1 percent to 2.5 percent. The 2026 forecasts accommodate diversion of traffic to and from other facilities such as Interstate 64, Route 10, and Route 35.

Forecasted travel time increases from 71 minutes to 79 minutes from existing conditions to Year 2026. The eight additional minutes required to travel from Route 58 to I-295 in the forecast year represents an increase of 11 percent, and a reduction in average travel speed from 42 mph to 38 mph. Details on travel time analyses are located in the *Route 460 Location Study: Traffic and Transportation Technical Report.*

1.5 PROVIDE ADEQUATE HURRICANE EVACUATION CAPABILITY

Route 460 is signed as a designated hurricane evacuation route for Southside Hampton Roads communities. Data from the Hurricane Emergency Response Plan indicates that the total number of people evacuating dwelling units south of the Hampton Roads Bridge Tunnel ranges from 103,200 to 421,000. The number of vehicles evacuating from these dwelling units ranges from 41,300 to 151,700. These figures do not include the employment based population and freight operations that may also be evacuating during an emergency. Additionally, these figures do not include the residents and tourist populations for northeastern North Carolina, including portions of the Outer Banks that would evacuate using Route 168 in Chesapeake. Clearance times estimated for these vehicles range from three to 26.75 hours for cities located in Southside Hampton Roads. Capacity improvements would reduce the clearance time during an emergency.

Despite Route 460's important role for hurricane and emergency evacuation, the roadway is susceptible to the effects of severe weather. During two recent hurricanes, this primary evacuation route for evacuating motorists was closed due to effects caused by these storms. The existing Route 460 has a narrow right-of-way that does not provide either a clear zone or shoulders adjacent to the travel lanes. The narrow right-of-way contributed to the amount of storm debris blocking the travel lanes during Hurricane Isabel in September 2003. In 1999, heavy rainfall from Hurricane Floyd caused flooding along the Blackwater River with the resulting river crest (about nine feet above the surface of the roadway) rendering Route 460 impassible for over a week.

1.6 IMPROVE STRATEGIC MILITARY CONNECTIVITY

Route 460 is a designated part of the 61,000-mile Strategic Highway Network (STRAHNET) by the Department of Defense and FHWA. Because Hampton Roads is home to several military installations, and the Petersburg area is home to Fort Lee, Route 460 (from Interstate 95 to Route 58) performs a critical role in preserving the nation's security and military preparedness.

The Military Traffic Management Command Transportation Engineering Agency (MTMCTEA) is responsible for the use of transportation facilities by the military, and identified the STRAHNET system. All non-interstate roadways that are part of the STRAHNET such as Route 460 are part of the National Highway System, and therefore should follow design guidelines based upon the functional classification of the roadway. Route 460 currently does not meet design standards for a rural principal arterial highway.

1.7 MEET LEGISLATIVE MANDATE

Federal, state, and local legislation identified the roadway as a high priority corridor for improvement. Two Congressional acts and one state act support study and investment in the Route 460 corridor. As part of the "East-West Transamerica Corridor", Route 460 has been designated as a "National Highway System high priority corridor" (Intermodal Surface Transportation Efficiency Act of 1991, Section 1105(c)(3)). Such corridors are included on the National Highway System, and are provided funding (Intermodal Surface Transportation Efficiency Act of 1991, Section 1105 (b)). On the state level, the Virginia Transportation Act of 2000 (VTA) allocated $25 million for Route 460 improvements. Local governments have either included Route 460 improvements in their comprehensive plans, and/or passed resolutions supporting improvements by their respective Board of Supervisors or Town Councils.

1.8 MEET LOCAL ECONOMIC DEVELOPMENT GOALS

Localities along the Route 460 study area have identified economic development priorities related to transportation, and in some instances have made specific mention of Route 460 as part of their economic development plans. Some jurisdictions stress the need for upgrading Route 460 in their comprehensive plans; some localities emphasize their dependence on Route 460 for economic development (see the *Purpose and Need Technical Report*).

Some jurisdictions stress the need for upgrading Route 460 in their comprehensive plans. The City of Suffolk's *2018 Comprehensive Plan* states that the road is a vital connector used for "regional goods movement and some commuting movement to the Eastern portion of Hampton Roads." *The Prince George County Comprehensive Plan* recommends reconstruction of Route 460 within the boundary of the Tri-Cities Area Metropolitan Planning Organization.

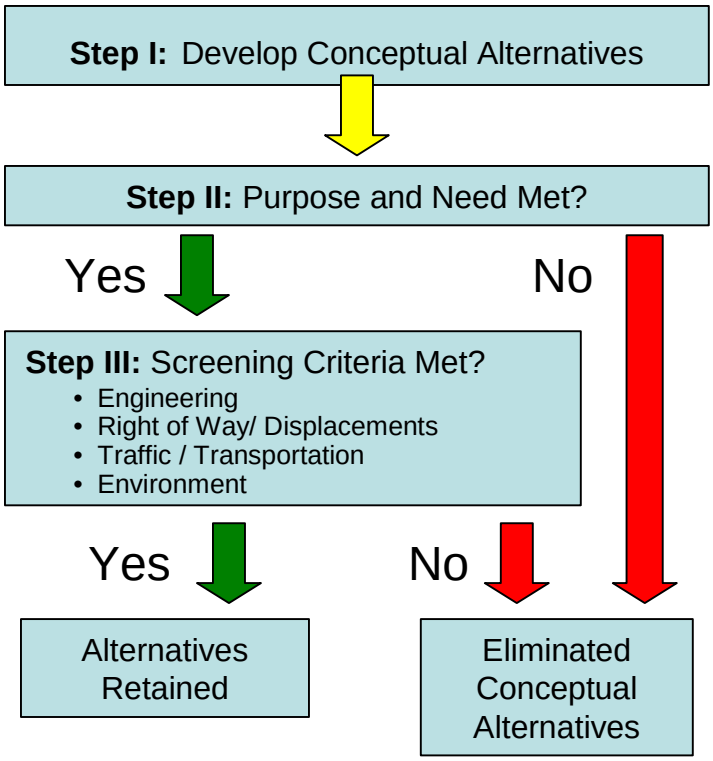
Other jurisdictions stress the importance of Route 460 to economic development. Sussex County's Comprehensive Plan Update recommends either commercial or industrial site development along Route 460. Prince George County's comprehensive Plan expects industrial and commercial development along Route 460. The Isle of Wight County Board of Supervisors passed a resolution in support of a "new limited access road in close proximity to the existing Route 460 corridor" to encourage moderate growth in the Town of Windsor. Southampton County's comprehensive plan cites the need to attract prospective industries with "accessibility to major thoroughfares." Accessibility, according to Surry County's *Land Development Plan*, is important for industrial development.

2.0 ALTERNATIVES

2.1 ALTERNATIVES DEVELOPMENT PROCESS

A three-step process was used to identify and screen project alternatives for the study, as shown in Figure 2.1-1. The first step developed conceptual alternatives based upon input from the public, local jurisdictions, and the Crater and Hampton Roads Planning District Commissions. The second step evaluated the conceptual alternatives' ability to meet the project's Purpose and Need as presented in Chapter One. Alternatives carried forward to the third step were then evaluated using engineering, right-of-way, transportation, and environmental criteria.

Figure 2.1-1
ALTERNATIVES SCREENING PROCESS



2.1.1 Step I— Development of Conceptual Alternatives

The process began with establishing design criteria and typical sections for facilities that would meet the study's Purpose and Need. These criteria are based on VDOT standards and guidelines as published in the VDOT Road Design Manual (1998), and meet the standards for the National Highway System. The VDOT standards and guidelines were developed using the 1990 edition of *A Policy on Geometric Design of Highways and Streets*, as published by AASHTO.

All conceptual build alternatives would connect the Route 58 Bypass in Suffolk to I-295 near Petersburg. These termini were selected in accordance with FHWA Technical Guidelines for logical termini selection and address the needs of the project, while allowing the evaluation of project alternatives that would function independently.

2.1.2 Step II—Purpose and Need Analysis

Step II evaluated the ability of each conceptual alternative to meet the Purpose and Need identified in Chapter One. Sections 2.2 and 2.3 describe the alternatives eliminated and retained.

2.1.3 Step III—Alternative Screening

Alternatives that were retained for Step III underwent more detailed analysis based on previously developed Screening Criteria. Screening criteria were divided into several categories: Engineering, Traffic/Transportation, Right of Way/Displacements, and Environment (see Table 2.1-1).

To screen the alternatives, travel demand estimates were prepared using a transportation model developed for the study. This "super-regional" model combines the Hampton Roads and Richmond regions' existing travel demand models (see the *Traffic and Transportation Technical Report* for more information). The model provided the study team with traffic volumes for each conceptual alternative. Preliminary cost estimates were based upon standard unit costs for materials used in highway construction, and include estimates for the bridges and interchanges. These preliminary cost estimates did not include estimates for right of way costs, relocation of utilities, landscape features, wetlands mitigation and other miscellaneous items.

Potential impact areas were identified for the conceptual alternatives based on 500-foot wide corridors. Impact areas for interchange or intersection locations consisted of circles with 2,000-foot diameters. Potential residential or commercial displacements were determined using high resolution aerial photography provided by the 2002 Virginia Base Mapping Program (VBMP). Impacts to other resources such as wetlands and protected species habitat were determined using existing digital mapping from VDOT's Geographic Information System (GIS). Impacts to known cultural resources were included in the Section 4(f) criterion. Selected environmental impacts were tabulated on a "per mile" basis, providing another means to compare alternative impacts. Later in the process, this approach also helped identify "hybrid" alternatives using crossover segments and /or portions of other alternatives. Section 2.3.3 provides more detail on build alternative development and screening.

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Table 2.1-1
SCREENING CRITERIA

Engineering	
Design Standards	Conform with desirable design standards
Preliminary Construction Costs	Anticipated relative construction cost
Traffic/Transportation	
Traffic Volumes	Local and through traffic demand
Transportation Network Compatibility	Conformance with existing and planned roadways
Right of Way/ Displacements	
Displacements	Number of residential and business displacements
Public Facilities and Services	Number of potential impacts
Environment	
Agricultural and Forestal Districts	Acres of potential impact
Wetlands	Acres of potential impact
Endangered Species	Number of potential habitat impacts
Cultural Resources	Number of potential impacts
Streams	Number and size of major stream crossing

2.2 ALTERNATIVE ELIMINATED

Table 2.2-1 shows the results of the Step II (Purpose and Need) analysis. A No-Build Alternative, a Transportation Systems Management (TSM) Alternative, a Mass Transit Alternative, and Conceptual Build Alternatives were evaluated in Step I. The table shows only the Conceptual Build Alternatives would meet the Purpose and Need. The Mass Transit Alternative has been eliminated from further consideration, while the TSM and No-Build Alternatives were retained for reasons discussed in Section 2.3.

Table 2.2-1
PURPOSE AND NEED ANALYSIS

Objective	No Build Alternative	TSM Alternative	Mass Transit Alternative	Conceptual Build Alternatives
Address Roadway Deficiencies	No	No	No	Yes
Improve Safety	No	No*	No	Yes
Accommodate Increasing Freight Traffic	No	No	No	Yes
Reduce Travel Delays	No	No*	No	Yes
Adequate Hurricane Evacuation Capability	No	No	No	Yes
Improve Strategic Military Connectivity	No	No*	No	Yes
Meet Legislative Mandate	No	No	No	Yes
Meet Local Economic Development Goals	No	No	No	Yes

*This alternative would result in modest improvements to these criteria.

2.2.1 Mass Transit Alternative

Similar to many rural and exurban areas, the study area currently does not have mass transit service. Therefore, this alternative would involve introducing one or a combination of mass transit modes to meet the Purpose and Need.

In 1993, the Federal Transit Administration published studies that concluded that public mass transit systems are only economically viable in areas with sufficient population densities and employment rates. The studies established standards-based criteria to evaluate an area's potential for mass transit. One standard is to have at least 7 dwelling units per acre linked to a Central Business District (CBD) with an employment base of at least 10,000 and a density of 20 employees per acre. The study area does not contain any CBDs that approach the 10,000 employee standard. Furthermore, employee densities are much less than the recommended 20 per acre. The Town of Windsor, for example had an employment density of 1.16 per acre (based on Census 2000 and 1999 town boundary).

The area's relatively low, widely-dispersed population precludes consideration of mass transit as a cost-effective solution. This alternative would not address roadway deficiencies, projected increases in freight traffic, legislative mandates or local economic development goals. Furthermore, the mass transit alternative would not improve hurricane evacuation capability. It does not meet the Purpose and Need, and was therefore removed from further consideration in Step I.

A separate study is underway regarding passenger rail service in the study area. The Federal Railroad Administration (FRA), in cooperation with the Virginia Department of Rail and Public Transportation (DRPT), will prepare a Tier I Environmental Impact Statement (EIS) for the Richmond to Hampton Roads Passenger Rail Corridor. The study will investigate potential routes and consider possible environmental impacts for higher-speed rail service. Issues regarding schedule, ridership, and operational and capacity constraints will also be examined. A variety of transit options gathered during the public input process will also be included.

2.3 ALTERNATIVES RETAINED

Alternatives retained for detailed analysis in the DEIS include the following:

2.3.1 No-Build Alternative

The No-Build Alternative assumes that currently programmed committed and funded roadway projects in the VDOT Six Year Plan and the Constrained Long Range Plan (CLRP) developed by the Metropolitan Planning Organizations (MPOs) will be implemented. The No-Build alternative does not address project needs such as improvements to roadway deficiencies, travel delay, hurricane evacuation, safety, and roadway infrastructure improvements. However, it has been retained to serve as a baseline for comparison with the build alternatives. The following is a list of committed projects to improve existing Route 460:

- City of Suffolk - arterial signal system - Kings Fork Road to west corporate limits;
- Sussex County - dual left turn lanes on VA 604;
- Prince George County - left turn lane signal modification on VA 156;
- Prince George County - left turn lane signal modification on VA 629/Quaker Road.

2.3.2 Transportation Systems Management Alternative

Transportation System Management (TSM) improvements are low cost system enhancements that improve the efficiency of the existing transportation system. A TSM alternative could include improvements such as high-occupancy vehicle lanes, ridesharing and signal synchronization. TSM could also include strategies to add capacity and improve operational deficiencies of the existing transportation

system, including: (1) intelligent transportation systems, (2) travel demand management, (3) access management, and (4) minor geometric improvements.

TSM enhancements identified for this project include the following:

- Add turning lanes at the intersection of Rt. 625
- Add turning lanes at the intersection of Rt. 601 to the north and Rt. 624 to the south
- Add right and left turn lanes to the intersection of Route 460 and Route 635
- Add advance warning lights and/or rumble strips for stop light at the intersection of Route 460 and Route 616
- Realign Route 460 and Route 618 intersection, with new right- and left-turn lanes
- Install rumble strips along the existing Rt. 460 centerline

These collective improvements provide only modest improvements to safety and roadway deficiencies and do not fully meet the Purpose and Need. However, the TSM Alternative has been retained for detailed study since it offers a low-cost option to improve transportation conditions in the study area.

2.3.3 Build Alternatives

According to AASHTO standards, rural principal arterials are characterized by corridor movements with trip length and density suitable for substantial statewide or interstate travel. The Conceptual Build Alternatives meet the Purpose and Need (Step I) and therefore were evaluated using the screening criteria in Step II. The build alternatives include sections on new alignment as well as sections on existing alignment; therefore two potential typical sections apply. All build alternatives have a design speed of 60 miles per hour.

Improvements on existing alignment would use a non-freeway rural principal arterial typical section (see Figure 2.3-1)**.** The VDOT *Road Design Manual* (1998) refers to this typical section as a GS-1 “other” roadway (“other” meaning “non-freeway”). With an average right of way width of 81 feet, this section uses either a center bi-directional turning lane (as shown) or a combination of raised and flush medians. Location-specific conditions would dictate shoulder width and/or the presence of curb and gutter sections. On cut and fill slopes, outside shoulders would be 10 feet wide and 13 feet wide, respectively.

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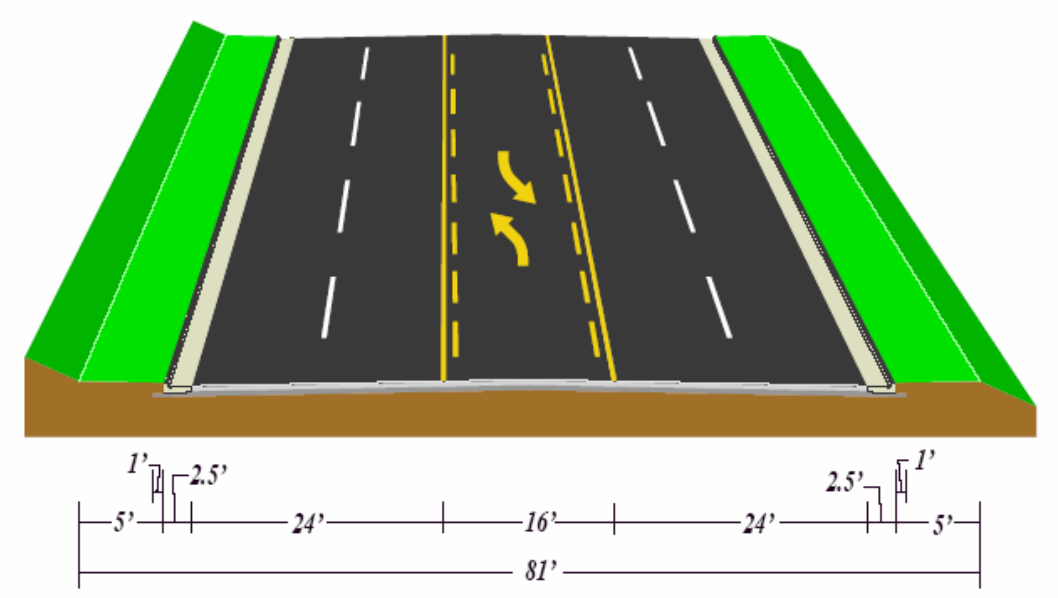
Figure 2.3-1
TYPICAL SECTION OF BUILD IMPROVEMENTS ON EXISTING ALIGNMENT



Build alternatives on new location would be classified as GS-1 (rural principal arterials) as stated in the VDOT *Road Design Manual*. Figure 2.3-2 depicts the typical section for the new location alternatives. The typical section consists of a four lane, divided highway with two 12-foot lanes in each direction. The divided highway section includes 40-foot wide depressed medians. Paved shoulders would be ten feet wide on the outside lane and four feet wide on the inside lane. On cut and fill slopes, outside shoulders would be 12 feet and 15 feet, respectively. The typical section would require an average right of way of 131 feet.

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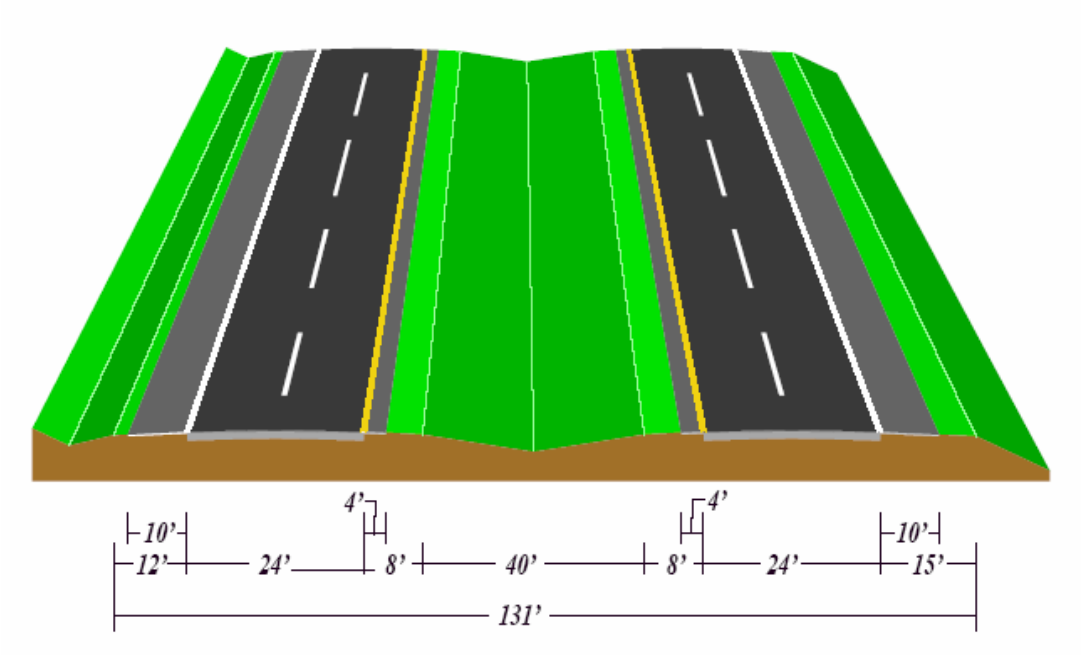
Figure 2.3-2
TYPICAL SECTION OF ALTERNATIVES ON NEW LOCATION



Source: Virginia Department of Transportation

The roadway network and traffic volumes in the study area were reviewed to determine appropriate access points for each conceptual alternative. This network would connect the conceptual alternatives with the communities at the following locations (listed from east to west):

- Route 258 to access Windsor and Smithfield
- Route 616 or 620 to access Ivor
- Route 31 to access Wakefield, Dendron, Surry and the Jamestown Ferry
- Route 40 to access Waverly
- Route 625 to access Disputanta
- Route 156 to access Prince George

Figure 2.3-3 displays the Conceptual Build Alternatives. The alternatives are described as follows:

- Alternative A starts at the Route 58 Bypass, south of the existing interchange with Route 460 and continues on the south side of existing Route 460 to I-295 in Prince George County. There is a bend in the alternative between Waverly and Wakefield to avoid the habitat of a federally protected species. Interchanges would be provided at the roadways identified above.
- The Improve Existing 460 Alternative follows the length of existing Route 460 within the study area. The narrow typical section depicted in Figure 2.3-1 would be used.
- Alternative B uses the alignment of existing Route 460 between the six communities located along the roadway, and includes northern bypasses around Windsor, Zuni, Ivor, Waverly, Wakefield, and Disputanta. The sections along the existing alignment would use the narrow typical section identified in Figure 2.3-1. The bypasses would use the typical section for new alignment alternatives. For each town bypass, there are three access points: one at each end of

the bypass where it joins with the existing Route 460, and one at the major perpendicular highway accessing the town (i.e. Route 258 near Windsor). Zuni's bypass does not have a third access point.

- Alternative C begins at the Route 58 Bypass, south of the existing interchange with Route 460 in Suffolk. The easternmost segment of the alternative is identical to Alternative A, however this alignment crosses to the north side of existing Route 460 near the Suffolk / Isle of Wight County border. The alignment remains north of the current Route 460 until just west of Waverly where it crosses over again and remains on the south side until the Interstate 295 interchange. Interchanges would be provided at the roadways identified above. Alternative C could also provide two interchanges with the existing Route 460 at the locations where it crosses the existing alignment (near the Suffolk / Isle of Wight County border, and west of Waverly).

- Alternative D is a limited access facility that begins in Suffolk at the Route 58 Bypass, south of the existing interchange with Route 460. The easternmost segment of this alternative is identical to Alternatives A & C; however Alternative D crosses to the north side of existing Route 460 in Isle of Wight County (slightly west of where Alternative C crosses Route 460). The alternative continues along an alignment north of Route 460, closer to the center of the study area than Alternative C. Between Route 31 and Interstate 295, the alternative moves further north into central Surry County before crossing into Prince George County. The alignment reconnects to the existing Route 460 alignment at the Interstate 295 interchange in Prince George County. Interchanges would be provided at the roadways identified above. Alternative D would also provide an interchange with the existing Route 460 in eastern Isle of Wight County, where the alignment crosses existing Route 460.

- Alternative E starts at the intersection of the Route 58 Bypass and runs north along a new alignment for approximately 1.8 miles before joining Godwin Boulevard (Route 10/32) near the intersection of Kings Fork Road. The alignment follows existing Godwin Boulevard for approximately 4 miles until near the Pembroke Lane intersection in Suffolk. New access points would be provided between the new alignment segment and the existing segment of Godwin Boulevard. The alternative continues northwest across central Isle of Wight, Surry, and Prince George Counties, following an alignment approximately seven miles north of the towns along existing Route 460. Interchanges would be provided at the roadways identified above. The alternative intersects Interstate 295 in a proposed new interchange located approximately four miles north of the existing Route 460 / I-295 interchange. Alternative E is the farthest alignment from the existing Route 460.

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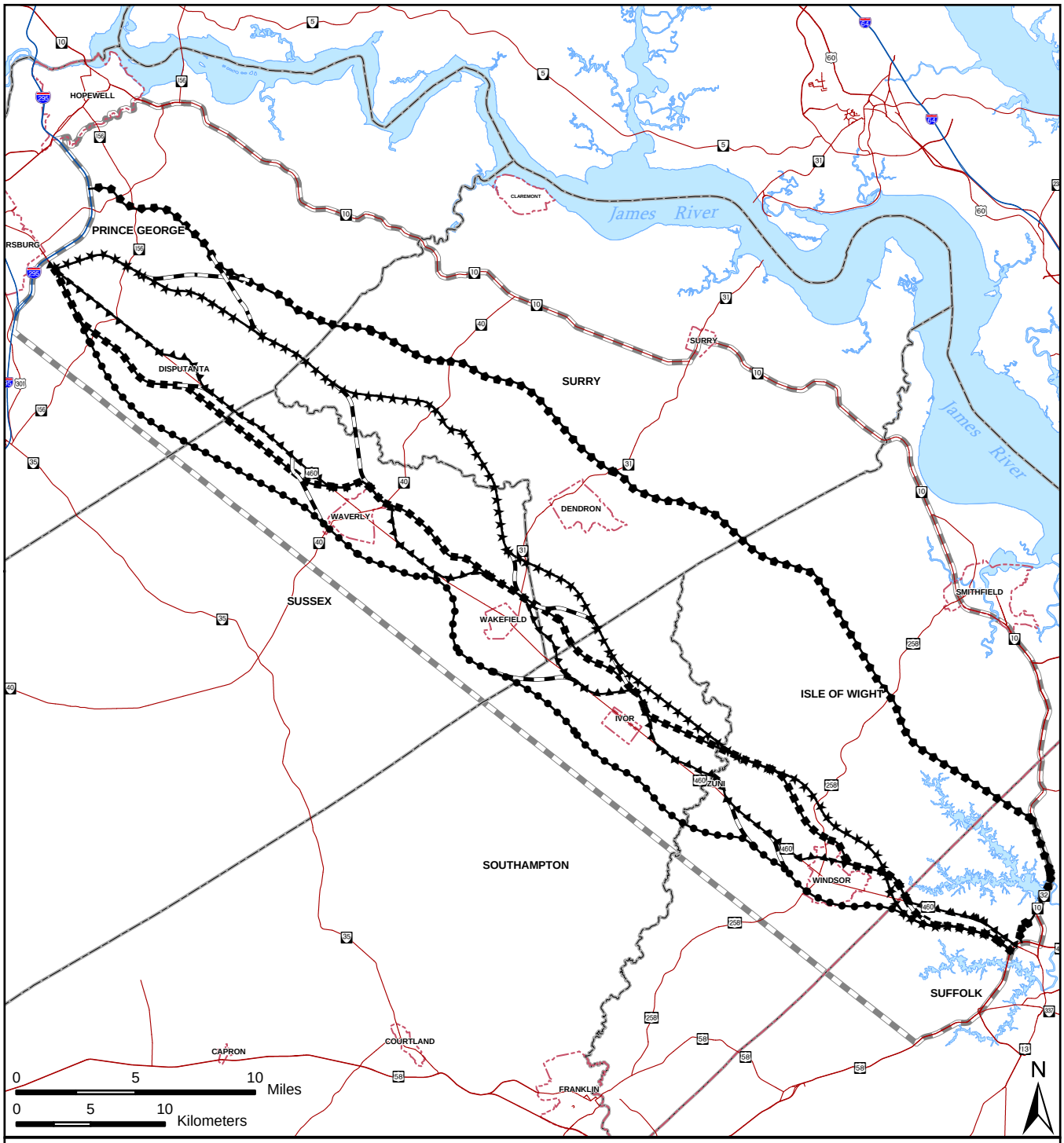

Alternative A
Alternative B
Alternative C
Alternative D
Alternative E
Crossover Segments
Study Area

FIGURE 2.3-3
CONCEPTUAL ALTERNATIVES

As mentioned previously, crossover segments and /or portions of other alternatives were examined to link portions of discrete alternatives. This process led to the addition of four "hybrid" conceptual alternatives (see Figure 2.3-4). These hybrid alternatives met the Purpose and Need while reducing impacts to one or more environmental constraints under study. The following list describes these alternatives:

- Hybrid Alternative AC combines Alternatives A and C. It follows the alignment of Alternative A from Suffolk to Waverly where, from Waverly and Interstate 295, it follows the alignment of Alternative C. This alternative is closer to existing Route 460 and yet has fewer displacements than Alternative A.
- Hybrid Alternative B1 is similar to Alternative B; however east of Windsor it is located on the new alignment south of existing Route 460 (the same alignment as Alternatives A and C). This hybrid alternative was created to reduce the number of potential displacements along the segment of existing Route 460 in Suffolk.
- Hybrid Alternative DC combines Alternatives C and D. It follows the alignment of Alternative C from Suffolk to Windsor, where it shifts to the Alternative D alignment. This alternative reduces impacts to Section 4(f) properties and Agricultural Forestal Districts, and also reduces the wetland impacts of Alternative C. However, because it follows the alignment of Alternative D on the west end, it does not provide convenient access to Waverly and Wakefield.
- Hybrid Alternative DC1 combines Alternatives C and D. The alignment follows Alternative C from Suffolk to Windsor, Alternative D from Windsor to Wakefield, Alternative C from Wakefield to Waverly, and Alternative D from Waverly to Interstate 295. Similar to Alternative DC, it reduces Section 4(f) and Agricultural Forestal impacts, but is closer to existing Route 460 towns such as Wakefield and Waverly.

Table 2.3-1 summarizes results of the conceptual alternatives evaluation.

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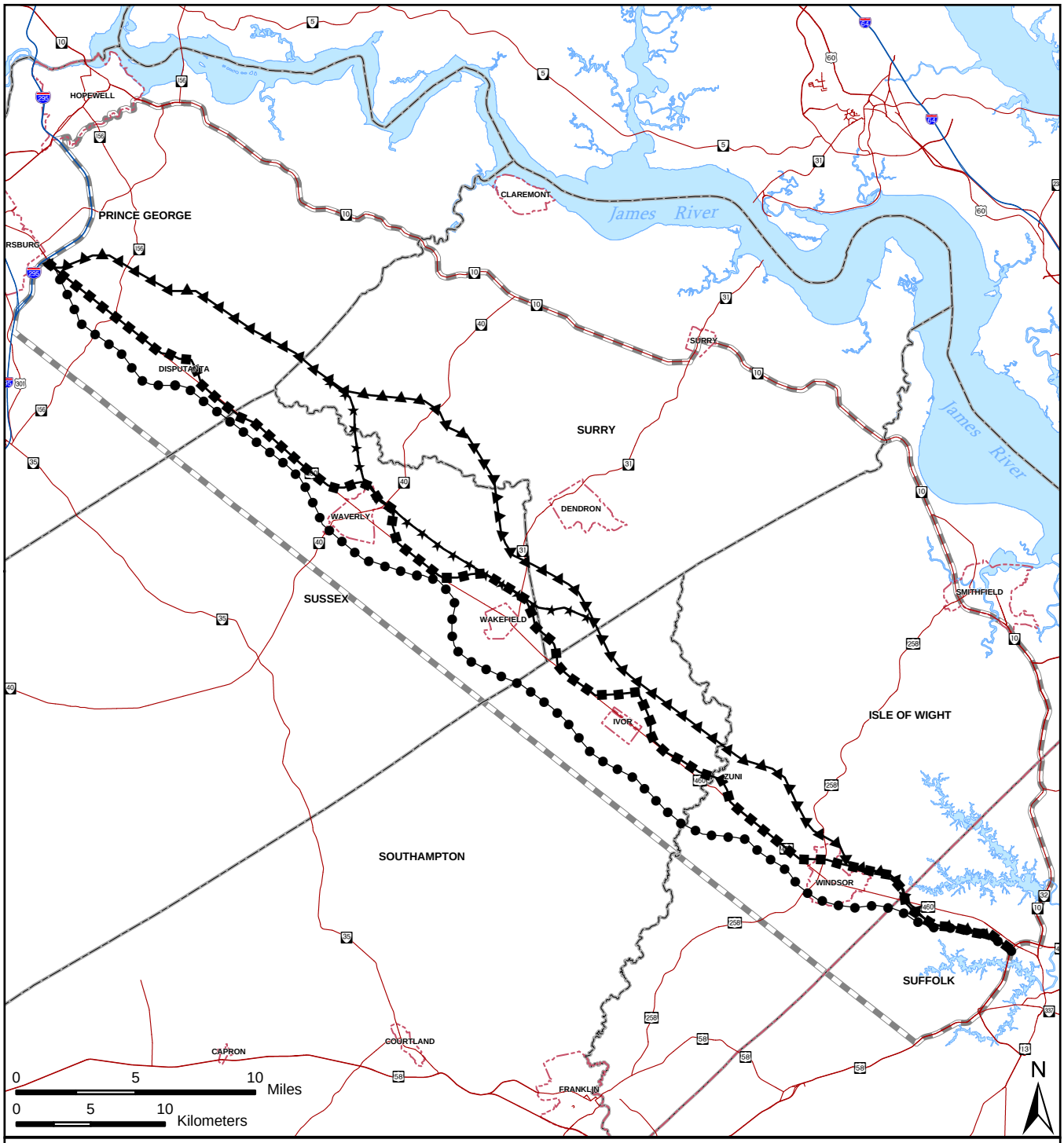

FIGURE 2.3-4
HYBRID ALTERNATIVES

Table 2.3-1
CONCEPTUAL ALTERNATIVE EVALUATION RESULTS

Objective	A	AC	Improve Existing	B	B1	C	D	DC	DC1	E
Engineering										
Design Standards: Conformance with desirable design standards	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Preliminary Construction Costs: (in millions)	$755	$786*	$445	$1,200	$1,159*	$865	$760	$790*	$809	$790
Hydraulic/ Hydrologic: number of stream crossings	29	27	36	39	40	24	29	32	33	37
Right of Way/ Displacements										
Displacements: Number of potential displacements	140	123	651	363	288	92	59	60	60	152
Public Facilities and Services: number of potential impacts	1	1	11	5	1	1	0	1	1	0
Environment										
Terrestrial Ecology: Acres of impacted Agricultural and Forestal Districts	23	23	0	0	0	5	50	5	5	359
Wetlands: acres of potentially impacted areas	352	366	236	347	349	362	299	284	341	279
Endangered Species: Number of potential habitat impacts	0	0	1	0	0	0	0	0	0	0
Section 4(f): acres of potential use	0	0	8	6	2	2	29	2	2	41
Traffic/Transportation										
Compatible with existing and planned highway facilities?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Traffic Volumes: Simulated Average Daily Traffic for 2026 Design Year										
West of Disputanta	31,100	30,200*	32,000*	32,000	32,000*	30,200	25,200	26,000*	29,000*	20,600
Waverly to Wakefield	25,800	25,800*	29,900*	29,900	29,900*	27,800	24,400	26,000*	26,000*	20,500
East of Windsor	31,500	31,500*	45,000*	48,200	45,000*	42,900	39,700	40,000*	40,000*	21,500

* Values estimated from analysis of original conceptual alternatives (A,B,C,D and E)

2.4 IDENTIFICATION OF CANDIDATE BUILD ALTERNATIVES

The screening process identified conceptual alternatives and combinations of alternatives that met project needs while reducing impacts to the human and natural environments. The ten alternatives listed in Table 2.3-1 were grouped by the study team according to their location in relation to the existing Route 460. The Improve Existing, B, and B1 Alternatives use some or all of the existing Route 460 alignment. Alternatives A and AC are both located south of the existing Route 460. The remaining alternatives (C, D, DC, DC1 and E) are each located north of the existing Route 460.

The Improve Existing 460 Alternative has the highest number of estimated displacements of the conceptual alternatives. Alternative B has the second highest number of displacements, and also has the highest cost estimate. The B1 hybrid was created to reduce the number of potential displacements compared to Alternative B.

The two alignments on the south side of existing Route 460 (Alternatives A and AC) have similar evaluation results. Alternative AC was created to reduce the number of displacements of Alternative A, and to develop an alignment closer to existing Route 460 near the western end of the study area.

Alternative E is located the farthest away from the existing communities along Route 460. It has the lowest forecast travel demand, and also a large number of displacements. Alternative D affects the most acres of Section 4(f) properties of all ten alternatives. Alternative C is close to the existing communities along Route 460; however it has a large number of potentially affected wetlands. Hybrid Alternative DC has a reduced number of Section 4(f) impacts, but also follows an alignment that takes it far away from Wakefield and Waverly. Alternative DC1 has similar characteristics of Alternative DC, but it provides better access to Waverly and Wakefield.

On April 2, 2004, the conceptual alternatives and screening results were presented at a federal agency Partnering Meeting. Agencies participating at the meeting included the US Army Corps of Engineers, the US Fish and Wildlife Service, the Environmental Protection Agency, and the Federal Highway Administration. Also, on April 14, 2004, the project Study Team, which includes staff from the Crater and Hampton Roads Planning District Commissions, met to further consider the alternative screening. Consideration of the public comments, input from the federal agencies during partnering, and technical review by the Study Team led to the elimination of some conceptual alternatives and retention of others for detailed study in the DEIS (see sections 2.2 and 2.3). The agencies involved agreed with eliminating Alternative E and the segments of Alternative D that were not associated with the DC1 Alternative. After consideration of this agency input, public comments, and technical review by the Study Team, the following alternatives were retained for detailed analysis the DEIS.

- Alternative AC, henceforth, **CBA One.**
- Alternative B1, henceforth, **CBA Two.**
- Alternative DC1, henceforth **CBA Three**.
- TSM Alternative
- No-Build Alternative

Figure 2.3-5 illustrates the Candidate Build Alternatives. Refinements to the alignment of each CBA have occurred to further reduce their impacts to the natural and built environment. These refinements have included shifts to avoid wetlands, properties eligible for listing on the National Register of Historic Places (NRHP), and planned development projects. These revised locations of each CBA alignment were used for impact analysis, and are depicted in the figures located in Chapter 4. For CBA 2, the centerline of proposed widening along the existing alignment was shifted to minimize potential displacements along the ROW. If CBA 2 is selected, more detailed consideration of improvements along the existing ROW would occur during final design. Improvements would be coordinated with local governments and would likely include access management to control the number of driveways and curb cuts along the route.

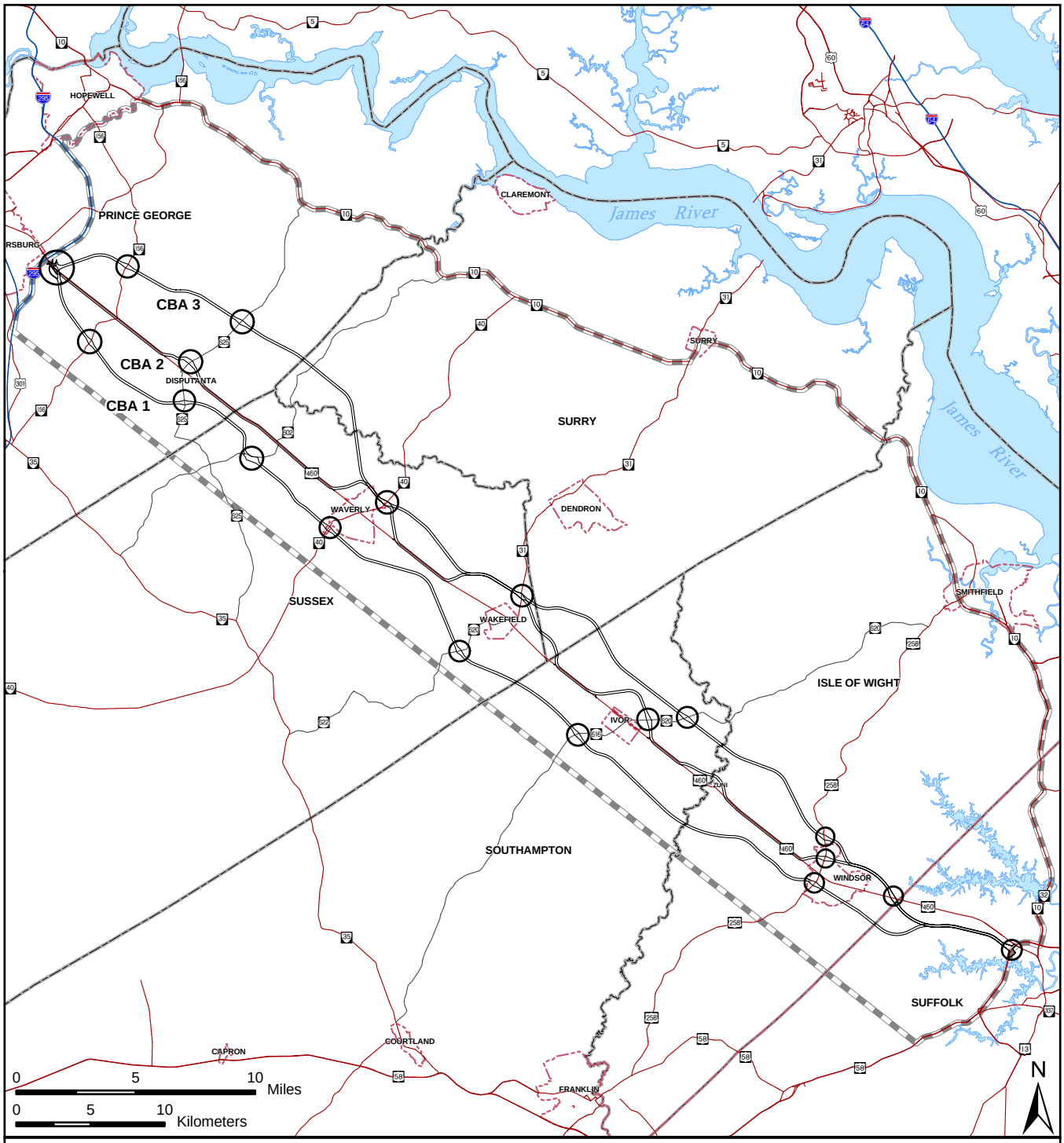

FIGURE 2.3-5
CANDIDATE BUILD ALTERNATIVES

2.5 ALTERNATIVE COMPARISONS FOR TRANSPORTATION FACTORS

The following sections summarize the differences among the alternatives with respect to transportation issues. The following information is also available in the Traffic and Transportation Technical Report.

2.5.1 Travel Demand

Table 2.5-1 depicts travel demand forecasts for the No Build and each CBA. This analysis assumes travel demand for the TSM and No-Build Alternatives are similar. The No Build/TSM forecast for 2026 indicates a growth in travel demand between 35 and 70 percent above existing conditions. Each CBA has a higher travel demand than the No Build/TSM forecast, indicating that a greater amount of travel is attracted with major improvements to the roadway corridor. Travel demand increases for CBA 2 range between 60 and 160 percent of existing travel demand. CBAs 1 and 3 attract the greatest increase in forecast travel demand, ranging between 160 and 425 percent of the existing travel demand.

Table 2.5-1
EXISTING AND FORECASTED TRAVEL DEMAND

From	To	Existing	Future Year (2026)							
		2003*	No Build/TSM	CBA 1		CBA 2		CBA 3	
				CBA 1	460	CBA 2	460	CBA3	460
I-295	VA 156	12,900	19,000	35,800	6,600	22,600	NA	30,100	9,400
VA 156	VA 625	14,900	20,700	33,300	6,500	24,600	NA	30,700	9,200
Disputanta Bypass		NA	NA	NA	NA	23,300	1,700	NA	NA
VA 625	VA 602	9,700	14,600	34,400	2,500	17,900	NA	30,800	4,400
VA 602	VA 40	8,600	13,600	34,300	1,400	17,100	NA	30,800	4,400
Waverly Bypass		NA	NA	NA	NA	21,300	1,900	NA	NA
VA 40	VA 31	12,900	18,600	30,600	4,000	20,700	NA	32,100	3,500
Wakefield Bypass		NA	NA	NA	NA	22,300	2,100	NA	NA
VA 31	VA 616/ VA 620	9,000	14,200	31,000	2,500	19,600	NA	33,000	2,200
Ivor Bypass		NA	NA	NA	NA	24,400	1,300	NA	NA
VA 616/ VA 620	VA 644	6,700	11,400	32,500	2,700	16,000	NA	33,400	1,400
Zuni Bypass		NA	NA	NA	NA	23,000	1,100	NA	NA
VA 644	US 258	8,500	13,600	32,500	1,600	18,900	NA	33,400	1,700
Windsor Bypass		NA	NA	NA	NA	27,700	5,000	NA	NA
US 258	WCL Suffolk	12,600	18,200	40,300	4,900	27,700	5,000	33,500	9,500
WCL Suffolk	Suffolk bypass	16,400	22,100	40,200	9,200	35,400	5,900	42,700	4,400

2.5.2 Roadway Capacity

The existing Route 460 is a four-lane undivided rural principal arterial. The No Build and TSM Alternatives do not increase through-roadway capacity in the study area. CBAs 1 and 3 add four new travel lanes (two per direction) between Suffolk and Petersburg. In addition, since CBAs 1 and 3 are proposed as limited access facilities, they would have more vehicular capacity than similar four-lane facilities lacking access control. Limited access facilities may carry up to 2,250 vehicles per hour per lane with free flow speeds of 55 miles per hour. At 65 miles per hour the capacity is 2,350 vehicles per hour per lane (Highway Capacity Manual, 2000). For a four-lane facility such as the ones proposed for CBAs 1 and 3, this equals the capacity to move over 100,000 vehicles per day per direction. CBA 2 adds bypasses to five of the communities along Route 460, thereby increasing capacity (at those locations) over the No Build alternative. CBA 2 also provides a new limited access alignment between the Route 58 bypass in Suffolk and Windsor, increasing capacity in this area. However, the capacity increase of CBA 2 is considerably less than CBA 1 and 3 because west of Windsor CBA 2 uses the same alignment as existing Route 460 (other than the new bypasses).

2.5.3 Level of Service (LOS)

Level of Service (LOS) measures how well traffic operates on the roadway. At intersections, LOS is a measure of the travel delay attributed to the traffic control devices (traffic signals). Along roadway segments, LOS is a measure of the roadway's ability to accommodate free-flowing traffic.

2.5.3.1 Intersection LOS

Table 2.5-2 illustrates intersection LOS along existing Route 460 in the study area for the PM peak hour. Existing LOS is generally acceptable, with a minimal delay at signalized intersections (LOS A , B and C). For the No Build Alternative, intersection LOS degrades from existing conditions due to greater traffic volumes and minimal improvements to the existing intersections in the future.

For the build condition, each CBA would improve LOS at the 12 existing Route 460 signalized intersections. This is due to the reduction in traffic on existing Route 460 compared to the no build and existing conditions. There are no new proposed traffic signals along the new alignments of the build alternatives (CBAs 1 and 3 or the bypass portions of CBA 2). CBA 2 would include a redesigned signalized intersection at Route 156 in Prince George County.

Table 2.5-2
INTERSECTION LEVEL OF SERVICE – EXISTING ROUTE 460

ID	Intersection	Existing	No Build	TSM	CBA 1	CBA 2	CBA 3
1	Route 630	A	B	B	N/A[1]	B	A
2	Route 156	B	C	C	B	C	B
3	Route 40	B	C	C	A	B	B
4	Route 31/628	A	B	B	A	A	A
5	Route 616	A	B	B	A	A	A
6	US 258	B	C	C	B	B	C
7	Route 610/603	C	D	D	C	C	C
8	Food Lion Access *	A	B	B	A	A	A
9	Dominion Way *	A	A	A	A	A	A
10	Route 604	B	B	B	B	B	B
11	Route 634	B	C	C	B	B	B
12	Robs Road/ Nansemond Suffolk Academy **	B	B	B	B	A	A

[1]CBA 1 would re-configure the existing intersection at Route 630, removing the existing traffic signal.

2.5.3.2 Roadway LOS

Roadway LOS along the alignment of existing Route 460 is depicted in Table 2.5-3 for the PM Peak Hour. From the west end of the study area to the Town of Windsor, Route 460 is considered a multilane highway by HCM standards. Due to the number of signalized intersections on the east end of the corridor, Route 460 is considered an arterial. Existing Route 460 operates at LOS A in the western rural area and LOS C to D in the eastern end of the corridor from Windsor to Suffolk. In the No Build Alternative, the roadway LOS degrades from existing conditions. The improvements proposed in the TSM Alternative would not greatly improve roadway LOS, therefore these results are similar to the No Build Alternative. Each build alternative would improve the roadway LOS on existing Route 460 due to the traffic diversion to the new alignment.

Table 2.5-3
ROADWAY LEVEL OF SERVICE – EXISTING ROUTE 460

Roadway Type	From	To	Existing LOS	No Build	TSM	CBA 1	CBA 2	CBA 3
Multilane Highways	I-295	Disputanta	A	B	B	A	B	A
	Disputanta	Waverly	A	A	A	A	A	A
	Waverly	Wakefield	A	A	A	A	A	A
	Wakefield	Ivor	A	A	A	A	A	A
	Ivor	Windsor	A	A	A	A	A	A
Urban Streets (arterials)	West of Windsor	East of Windsor	D	E	E	D	D	D
	East of Windsor	Route 58 Bypass	C	D	D	C	C	C

2.5.4 Travel Time Savings

Table 2.5-4 shows existing and forecasted travel times for eastbound travel through the study area from Petersburg to Wakefield and from Petersburg to Suffolk. Existing travel times for these two trips are 37 minutes and 73 minutes respectively. Travel times would increase in the No Build Alternative and TSM Alternative since factors leading to delay (additional traffic) increase without significant roadway improvements. Travel times for the No Build and TSM alternatives would increase by four minutes to Wakefield and eight minutes to Suffolk. This represents an 11 percent increase in travel times to these two communities from the existing travel time.

For CBA 2, travel time to Wakefield from Petersburg is forecasted to increase by two minutes over existing conditions. This represents a five percent increase in travel time. For through-travel to Suffolk from Petersburg, CBA 2 enables a two-minute time savings (3 percent improvement over existing conditions). When compared to the longer travel times forecast in the future (No Build), CBA 2 provides two minutes (five percent) travel time savings to Wakefield, and ten minutes (12 percent) travel time savings from Petersburg to Suffolk.

CBA 1 and CBA 3 both provide greater travel time savings than CBA 2. For travel from Petersburg to Wakefield, CBA 1 provides two minutes (5 percent) time savings compared to existing conditions, and six minutes (15 percent) reduction in travel time compared to the No Build Alternative. For travel to Suffolk, CBA 1 provides 13 minutes (18 percent) travel time savings compared to existing conditions, and 21 minutes (26 percent) time savings compared to the No Build Alternative. Similarly, CBA 3 provides three minutes (8 percent) time savings compared to the existing conditions for travel to Wakefield. CBA 3 also provides 13 minutes (18 percent) time savings compared to existing conditions for travel to Suffolk.

Table 2.5-4
EASTBOUND TRAVEL TIME COMPARISONS FROM PETERSBURG

Change in Travel Times	Petersburg to Wakefield (2003 Existing Conditions: 37 minutes)				Petersburg to Suffolk (2003 Existing Conditions: 73 minutes)			
	2026 No-Build & TSM	CBA 1	CBA 2	CBA 3	2026 No-Build & TSM	CBA 1	CBA 2	CBA 3
2026 Travel Time (minutes)	41	35	39	34	81	60	71	60
Change from Existing Conditions (minutes / %)	+4 (+11%)	-2 (-5%)	+2 (+5%)	-3 (-8%)	+8 (+11%)	-13 (-18%)	-2 (-3%)	-13 (-18%)
Change from 2026 No Build Conditions (minutes / %)	NA	-6 (-15%)	-2 (-5%)	-7 (-17%)	NA	-21 (-26%)	-10 (-12%)	-21 (-26%)

2.5.5 Hurricane Evacuation

Hurricane evacuation capability is directly related to roadway capacity. The No Build and TSM Alternatives do not improve the ability of the corridor to provide hurricane evacuation. As previously discussed above, CBAs 1 and 3 provide two new travel lanes per direction between the Suffolk Bypass and Interstate 295. Limited access roadways can accommodate up to 2,400 vehicles per direction per lane when operating in free flow conditions. Conceptually, it would be possible (using travel flow reversal) to have four lanes of highway capacity used to evacuate Hampton Roads and the Outer Banks from a hurricane. This additional capacity would considerably increase the ability of the Route 460 corridor to provide hurricane evacuation capability.

CBA 2 provides bypasses around the towns, providing some additional roadway capacity and removing the sources of delay from existing Route 460 (traffic signals, access points, and speed restrictions of the through town segments). Due to the time savings achieved for through corridor travel, CBA 2 would improve hurricane evacuation capability in relation to the existing conditions. However CBA 2 would not significantly enhance evacuation capacity in comparison to CBAs 1 and 3 because the additional roadway capacity does not extend along the entire length of the study corridor.

2.5.6 Freight Accommodation

Truck traffic currently constitutes a large percentage of total traffic along Route 460 and is expected to increase due to growth in the port facilities in Hampton Roads. The percent of trucks traveling along Route 460 is forecast to increase in the No Build, TSM, and for each build alternative. However, along existing Route 460, truck percentages are forecast to decrease substantially with each build alternative. See Table 2.5-5 for a summary of truck percentages for each alternative.

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Table 2.5-5
TRUCK PERCENTAGES

Location	2003 Existing Conditions	Future Year (2026)						
		No Build /TSM	CBA 1		CBA 2*		CBA 3	
	% truck	Truck %	CBA 1 truck %	460 truck %	CBA 2 truck %	460 truck %	CBA 3 truck %	460 truck %
West of Disputanta	30%	36%	38%	9%	35%		49%	9%
Disputanta to Waverly	28%	37%	32%	9%	35%		39%	9%
Waverly to Wakefield	28%	34%	35%	9%	34%		37%	9%
Wakefield to Windsor	28%	36%	34%	8%	34%		35%	8%
East of Windsor	23%	30%	28%	7%	30%		38%	7%

* Route 460 and CBA 2 share the same alignment outside of the bypasses. The forecast truck percentage through the towns on existing Route 460 ranges from 7 to 9%.

2.5.7 Safety

Each alternative would include safety improvements, including the No Build Alternative. The TSM alternative would involve additional improvements--improving sightlines at major intersections and providing additional turn lanes at select intersections along Route 460. CBA 2 provides limited access bypasses and new medians on the existing alignment of Route 460. However, the locations between the bypasses would still include numerous access points (driveways and side streets). CBAs 1 and 3 would be limited access highways on new location. These facility types are generally safer facilities than other non-divided roadways.

2.6 TOLL FEASIBILITY STUDY

A study was conducted in conjunction with the Location Study to evaluate issues related to implementing tolls on two of the build alternatives (CBA 1 and CBA 3). CBA 2 is not a candidate for tolling because (1) it is not entirely a limited access facility; and (2) only 55 percent of its length may be effectively tolled. Given the preliminary nature of the Location Study, it is too early in the project development timeframe to determine if the selected alternative would be a toll facility, or to determine a potential toll structure. Traffic forecasts and impact analysis that rely on traffic forecasts (e.g. air quality and noise) did not consider tolling.

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